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TRAINING RANGE SITE CHARACTERIZATION
AND RISK SCREENING
REGIONAL RANGE STUDY
JEFFERSON PROVING GROUND
MADISON, INDIANA
USACHPPM PROJECT NO. 38-EH-8220-03
SEPTEMBER 2002

1 REFERENCES

Appendix A provides a list of general references used in this document. The soil, surface water and sediment, ground water, vegetation, and rodent investigation sections contain specific references to each respective media.

2 AUTHORITY

The U.S. Army Environmental Center (AEC) has requested that the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) examine several ranges for the potential impact of munition use (contamination) on soil, ground water, and surface water resources and plant and stream biota.

3 PURPOSE

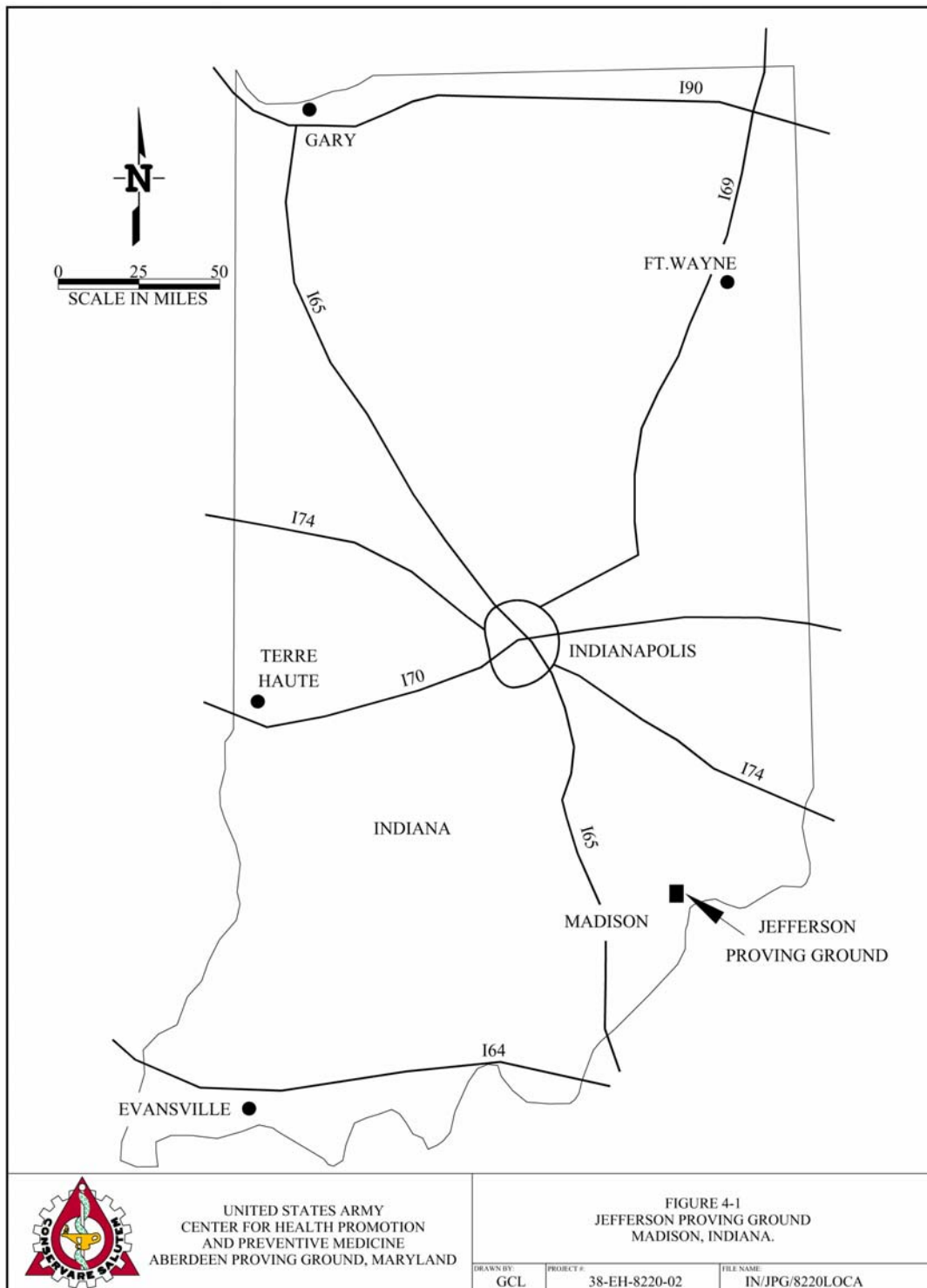
The purpose of this range study was to conduct a limited focus investigation of the potential chemical impact of normal, live-fire range training operations that historically occurred at the JPG impact areas. This investigation consisted of sampling the soils, surface water and sediments, ground water, vegetation, and the sperm of a limited number of small mammals. A screening level human risk assessment based on U.S. Environmental Protection Agency (USEPA) methods was conducted using the data collected from the sampled media. Biological resources were generally characterized to conduct a screening level ecological risk assessment and to identify potential ecological hazards.

4 GENERAL

4.1 LOCATION

Jefferson Proving Ground is located in southeast Indiana (See Figure 4-1). The installation consists of 55,265 acres and is located in portions of Ripley, Jennings, and Jefferson Counties. The installation is 18 miles long (north – south) and varies from 3-6 miles wide (east – west). The area north of the firing line is considered the range, and comprises the majority of the installation. This area is characterized by forests and grasslands and is predominantly devoid of any structures.

FIGURE 4-1. LOCATION MAP



4.2 HISTORY

Jefferson Proving Ground, in operation from 1941 to 1995, was established to meet the need for conducting research and development tests and production acceptance tests during World War II. Prior to being established as a munitions and ordnance testing facility, JPG land use consisted of farmland and woodland. Past activities have included detonation, burning, and disposal of many types of waste propellants, explosives and pyrotechnic substances. The types of munitions and ordnance tested at JPG include: propellants, mines, ammunition, cartridge cases, artillery projectiles, mortar rounds, grenades, tank ammunition, bombs, boosters, and rockets.

JPG became a subcommand of the U.S. Army Test and Evaluation Command (TECOM) in 1962. Identified for Base Realignment and Closure (BRAC) in 1989, JPG ceased operation in 1995. In 1997, TECOM and the U.S. Fish and Wildlife Service (USFWS) signed a Memorandum of Understanding granting the USFWS a 25-year real estate permit. This has enabled the USFWS to establish the Big Oaks National Wildlife Refuge, encompassing approximately 51,000 acres north of the firing line. The USFWS allows limited public access for hunting, fishing, and tours.

The impact area, encompassing 51,000 acres north of the firing line, consists mostly of wooded land and some areas that were chemically (i.e., pesticide application) and physically maintained for certain munitions testing. The firing line, located north of the cantonment area, consisted of 268 gun positions. According to archive reports, there were 50 impact fields with associated safety fans. It is important to note that most of the unexploded ordnance (UXO) contamination is not limited to the impact areas. This is due to the fact that the actual target areas were used only when the detonation and/or impact of the projectile was important to the test. Therefore, many of the munitions tests used for velocity measurements, gun tube proofing, or propellant were not fired into specific impact areas and may be found anywhere north of the firing line. A small portion of the range is still used by the Air National Guard for training missions.

Installation personnel voiced their concern for the possible presence of submunitions. The potential for contamination from submunitions fired into the northern portion of the impact area is largely due to the irregular manner in which this type of weapon discharges. For safety purposes, areas into which submunitions were fired were not considered as potential sample areas.

The USFWS began to manage the natural resources of the installation on October 1, 1996 under a 3-year Memorandum of Agreement (MOA) with the Army. The service expanded its role to make the area a national wildlife refuge through a new MOA in May 2000. The natural resources north of the firing line are managed by the USFWS as the Big Oaks National Wildlife Refuge (USFWS, 2000). While the entire area north of the firing line is considered to be UXO contaminated, there are specifically designated impact areas that received the most use.

5 ENVIRONMENTAL SETTING

The following is a brief, general discussion of the environmental setting. More detailed discussions can be found in the specific media sections.

5.1 CLIMATE

The area has a typical mid-western continental climate, and the weather is quite variable because of the influx of high and low pressure systems and warm moist air from the Gulf of Mexico. Summers are generally quite warm, while the winters are moderately cold. Precipitation is fairly uniform throughout the year, averaging 3 - 4 inches per month. Spring and summer thunderstorms push the monthly average over 4 inches for the March-June period, while the fall of the year sees monthly rainfalls close to 3 inches. Measurable snowfall can be experienced throughout the November-March period, and averages about 16 inches annually. Approximately 39 days per year see temperatures exceeding 90° F, with occasional occurrences in excess of 100° F. The record high of 105° F occurred in July 1954. Winter temperatures are mild, with occasional periods of very cold temperatures. Although temperatures less than zero are uncommon, the record low temperature in the area is -25° F occurring in January 1994. Winds vary from about 6 - 10 miles per hour from the south throughout the year, except for the months of February, March, and August when the direction is from the north-northwest. Wind gusts up to 78 miles per hour have been recorded at the Louisville Station, the nearest source of long-term climatological data. The strongest gusts are normally associated with thunderstorms. The area can experience occasional severe weather, including tornadoes.

5.2 TOPOGRAPHY, SOILS, HYDROLOGY, AND GEOLOGY

Ground elevations at the refuge are generally between 850 - 900 feet Net Geodetic Vertical Datum (NGVD), with elevations along the numerous streams flowing through the area being about 30 - 50 feet lower. Site drainage is generally to the west and southwest. The area is in the headwaters of the White River Basin (which includes the Muscatatuck River area), a major tributary of the Wabash River, which in turn is a major tributary of the Ohio River. Small to moderate size streams flowing through JPG include: Otter, Graham, Little Graham, Big and Middle Fork Creeks. The refuge would be located in the Till Plains section of the Central Lowlands physiographic province. The topography is dominated by gently rolling hills as a result of glacial processes. The bedrock exposed in Jefferson and Ripley Counties belongs to the Ordovician, Silurian, and Devonian Systems of the Paleozoic era. These rocks were deposited about 350 to 450 million years ago as fine-grained sediments in shallow marine waters. The strata dip 20 to 25 feet per mile to the west. In the site area the rocks at the surface are the Silurian rocks. The Devonian bedrock is composed predominantly of limestones that exhibit karst features in some areas. The site is underlain by deep, nearly level and gently sloping, poorly drained and somewhat poorly drained soils formed in a thin mantle of loess and in the underlying glacial drift. The surface layer of the soil is generally dark grayish brown or grayish brown, mottled, silty sandy clay, to a depth of 12 inches. The subsoil layer is composed of silty sandy clay that is light gray, yellowish brown, mottled, and friable. The subsoil layer extends below a depth of 6 feet. The available water capacity of the soil is very high and the permeability is slow. There is a perched, seasonal high water table at or near the surface during the winter and spring months.

5.3 VEGETATION AND WILDLIFE

Upland forests comprise 54% of the 50,000-acre refuge. The second most abundant habitat at JPG is grasslands. This habitat type makes up 17% of the area. Other habitat types at JPG include palustrine wetland (10%), woodland (6%), early successional shrubland (12%), open water (0.5%), and bare soil and paved areas (0.5%). A total of 46 state-listed plant species are found on the proposed refuge.

The JPG provides habitats for, and subsequently attracts, an abundance of wildlife species, including freshwater mussels, fish, amphibians, reptiles, mammals, and birds. The state-endangered river otter was reestablished on JPG in 1996.

The wide array of both resident and migratory species found at JPG is due to the grassland/forest/wetland complex found within the landscape of the installation. These large habitat blocks of forests, shrublands, grasslands, forested wetlands, and occasional emergent marsh contribute to the increased biodiversity of the natural communities found at the refuge.

The Big Oaks National Wildlife Refuge was named a Globally Important Bird Area by the American Bird Conservancy due to large Henslow's sparrow populations within the grassland areas. The Indiana Department of Natural Resources states that, "JPG is indeed a natural treasure that contains a full array of the region's natural communities and species assemblages."

5.4 SURFACE WATER

JPG has an extensive system of surface water resources, including ponds, lakes, streams and wetland areas, along with numerous ephemeral streams, ponding sites, and wet areas. These drainages appear to have developed along major fracture lineaments. Surface water at JPG generally flows along northeast to southwest trending stream drainages that eventually join the Muscatatuck River to the west. Four major watersheds traverse JPG from east to west. Starting in the south and heading north; Middle Creek, Big Creek, Little Graham Creek, and Otter Creek. Two important watersheds originate on JPG in the heart of the more significant impact areas. They are Marble Creek and Middle Fork Creek. Middle Fork Creek has an approximate average flow of 50 cubic feet per second.

There are at least 10 ponds or lakes on the installation, varying in size from less than 1 acre to 165 acres. Most are stocked with various kinds of game fish by the Indiana Department of Natural Resources. The largest is Old Timbers Lake in the northeastern corner of JPG at the headwaters of Little Otter Creek, which drains into Otter Creek. This lake covers approximately 165 acres. The second largest lake is Krueger Lake which covers some 8 acres. This lake is also stocked with fish and used for recreation.